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A WEEDING IN TEN-YEAR-OLD NORTHERN HARDWOODS—METHODS AND TIME REQUIREMENTS

Although weeding young northern hardwoods is not a common practice, most foresters will agree that weeding such stands is silviculturally sound in terms of improved growth and quality. Major obstacle to the widespread weeding of young stands as a routine cultural treatment is lack of information about the techniques and costs involved.

As part of an intensive northern hardwood management study at the Bartlett Experimental Forest, in Bartlett, New Hampshire, some information on weeding techniques and costs was recently obtained. Data for one specific weeding operation are presented here, including the relationship of man-hour requirements to number of crop trees per acre, and observations on crew organization and equipment.

The Young Stands

The young sapling stands in which the weeding was done occupied small areas, patches of 0.3 to 0.9 acre that had been clearcut 10 years before. These patches represented the first cutting in a compartment of northern hardwood timber that was to be harvested and regenerated by the patch-cutting system.

The regeneration in patches of this size in the Bartlett area is expected to contain a high proportion of yellow and paper birches.[1] This expecta-

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[1] See: Gilbert, Adrian M., and Jensen, Victor S. A MANAGEMENT GUIDE FOR NORTHERN HARDWOODS IN NEW ENGLAND U S Forest Serv Northeast Forest Expt Sta , Sta Paper 112, 22 pp , illus , 1958

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tion was realized: both birches were well represented in the 10-year-old sapling stands. However, these birches were being badly crowded by other species, particularly by the fast-growing noncommercial pin cherry and striped maple. Weeding to release the more promising birch stems was deemed necessary to maintain them in the stands, as well as to stimulate their growth.

Eighteen patches, having a total area of 11 acres, were weeded in the operation described here. Besides yellow birch and paper birch, pin cherry, and striped maple, the species present included sugar maple, white ash, red maple, and beech. Much of the regeneration was of seed origin, but there were occasional sprout clumps of red maple and root suckers of beech. The taller stems, from which crop trees were selected for release, ranged in height from 15 to 25 feet and in diameter from 1 to 3 inches at breast height.

Both total stocking and the stocking of desirable species varied considerably. Most patches were insufficiently stocked with good stems of commercial species to provide the desired number of suitably spaced crop trees (about 200 per acre). Some patches had only a few crop trees, and were occupied largely by pin cherry, striped maple, and other growth of no commercial promise.

Field Procedures

All the weeding was done on a crop-tree basis. Species, form, crown class, freedom from disease and damage, and origin (seedlings in preference to sprouts) were the major factors considered in choosing the individual crop trees (fig. 1). To conform with the objectives of patch cutting—that is, to produce new stands containing a high proportion of the birches—yellow birch and paper birch were favored over other commercial hardwoods wherever they qualified as good crop trees. In fact, most of the crop trees chosen were birches: 60 percent were yellow birch and 29 percent paper birch. The rest of the crop trees were sugar maple (6 percent), white ash (2 percent), beech (2 percent), and red maple (1 percent). A total of 1,305 crop trees were chosen in the 18 patches.

Crop trees were chosen at a flexible 15 x 15-foot spacing, which would result in about 200 crop trees to the acre if strictly followed. Actually, it was possible to adhere to this spacing only in those patches or parts of patches that were exceptionally well stocked with good seedling stems of commercial species. The actual selections varied by patches from 36 to 205 crop trees per acre, and averaged 118 trees per acre.

Figure 1—A typical yellow birch crop tree after weeding.

The original plan was to remove or kill all trees, regardless of species or quality, that were competing directly with the crown of a selected crop tree. In practice this was modified, and some competing trees of crop-tree caliber were left as insurance. The number of trees removed around each crop tree varied little, averaging 4.0 stems per tree. In size, the trees removed were comparable to the crop trees—ranging mostly from 15 to 25 feet tall.

The weeding crew consisted of three men: a forester selected crop trees, marked trees to be removed, and kept records; two laborers cut or treated the marked trees. For our modest-size job, this crew organization was efficient and quite satisfactory.

Generally, trees up to 2 inches in diameter at breast height were cut, and larger ones were frilled and treated with 2,4,5-T solution. However,

Figure 2—The Sandvik bush ax was safe to use. It proved to be adequate for both frilling, as shown above, and for cutting small trees.

Figure 3—Frilled trees were treated with 2,4,5-T in oil, carried in these handy squeeze bottles. Only the larger stems and most stump sprouts were frill-treated.

competing trees that were overtopping or severely rubbing the branches of the crop trees usually were cut and pushed to one side. For the whole job, 89 percent of the trees removed around crop trees were completely severed; only 11 percent were frill-treated with 2,4,5-T.

The tools used were a 2-pound single-bit ax, a Sandvik bush ax, and a plastic squeeze bottle of 2,4,5-T in oil. The two types of axes made a good combination for cutting or frilling the sapling-size stems (figs. 2 and 3). Since the undergrowth in many of the patches was dense, the Sandvik tool was especially well adapted for the job; it was not only efficient, but also much safer to use than most other cutting tools. For severing stems, the Sandvik tool was best suited for those smaller than 3 inches in diameter; the conventional-type ax was better for larger trees. However, for frilling the larger trees, the Sandvik tool worked very well.

Six of the 18 patches were worked over with no preliminary subdivision of the area. The remaining 12 patches were divided into 15-foot lanes in advance of the crew. This was done by one of the laborers who went ahead and marked the lanes with light grocery string. When the stringing was finished he returned to the crew, and the job proceeded as usual. Stringing lanes in this manner had advantages: it insured even coverage of the area, oriented the crew, and helped guide the spacing of crop trees. This was particularly helpful in the denser stands.

Time Requirements

Weeding time per acre ranged from 6.0 to 24.6 man-hours, and averaged 14.5 man-hours, exclusive of travel time to the work area and between patches. Several factors influenced weeding time: number of crop trees released per acre, steepness of slope, rockiness, amount of underbrush, and in some cases problems in selecting the crop trees. Where acceptable crop trees either were scarce, or plentiful but unusually uniform in quality, the choices sometimes were difficult.

Of these factors, only number of crop trees released per acre was easily measurable. Accordingly, a simple regression equation was developed to estimate weeding time, using number of crop trees released per acre as the independent variable:

$$Y = 4.06 + 0.088X$$

where Y is estimated weeding time in man-hours per acre, and X is number of crop trees released per acre. The independent variable in this equation accounts for 58 percent of the variation in weeding time. The standard error of estimate is $\pm$ 3.68 man-hours per acre (fig. 4). Although the equation is not precise, it should be helpful for estimating weeding time in similar operations.

Discussion

If weeding were undertaken on a commercial scale in young stands similar to those treated in this study, the man-hour requirements could undoubtedly be reduced. For instance, except for occasional rough checks, crop-tree tallies would be unnecessary on a production job, and no marking or recording of trees removed would be done. Assuming qualified men were available, one technical man could supervise several crews after they had been trained to select crop trees and perform the requisite weeding treatments.

Our weeding experience to date, as here reported, has provided some information on techniques, accomplishments, and man-hour costs that
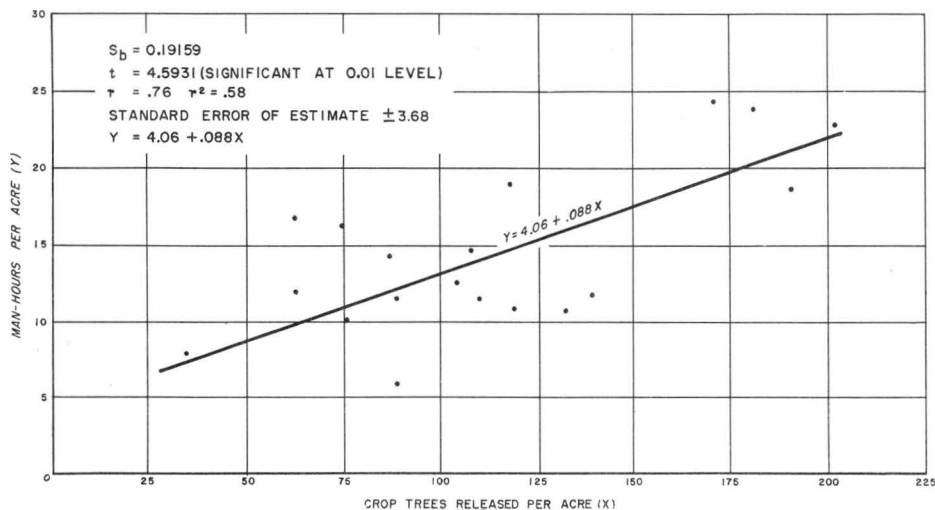
Figure 4—Regression of man-hours on number of crop trees released.

may be helpful to other managers of northern hardwood forests who wish to try weeding treatments in their young sapling stands. We cannot as yet judge the silvicultural merits of the weeding we have done, but as time goes on, the silvicultural effects can be evaluated. These effects will give some indication of whether benefits to justify the costs can be expected, and also will provide background information for setting up comprehensive, well-designed studies to determine how and when to weed, and the cost-and-return relationships.

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